

# PATENT SPECIFICATION

## DRAWINGS ATTACHED

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966,741



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D1 FX; D1 W(7A, 7C)

International Classification: —D 03 d (D 01 b, D 02 d)

### COMPLETE SPECIFICATION

#### Improvements in or relating to Long-wearing Papermakers' Dryer Felts

We SCAPA DRYERS LIMITED, a British Company of Cartmell Street, Blackburn, in the County of Lancaster do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention concerns improvements in or relating to papermaker's dryer-felts and more particularly concerns improvements in or modifications of the invention described and claimed in the Specification of our Application for Patent No. 796,562 hereinafter called the Parent Application.

Prior to the Parent Application aforesaid dryer-felts were commonly woven from cotton or combinations of cotton and asbestos yarns. The invention of the Parent Application relates to dryer-felts having a substantially longer life than such cotton or asbestos felts customary prior thereto, such longer life being obtained by employing for either or both warp and weft in weaving a dryer-felt according to customary procedure a plied yarn in which a filamentous synthetic material, such as, for example, filament nylon, is wound around a core of cotton or other usual natural fibre yarns so as to form an open protective helix around such core, the filamentous synthetic material constituting from 6% to 14% by weight of the felt.

More particularly in the said Specification of the Parent Patent aforesaid there is described and claimed, inter alia, a papermakers' dryer-felt some at least of the constituent strands of which are composite strands each having a core of plied yarns of natural fibres wound around with open helical windings of filamentous synthetic material, such material constituting from 6% to 14% by weight of

the felt and forming protective windings whereby a disproportionately greater useful life of the felt is obtained.

There is also described and claimed in the Specification of the Parent Application a method of making such a papermakers' dryer-felt which comprises preparing composite strands by twisting together a plurality of cotton yarns with at least one filamentous synthetic yarn while delivering the cotton yarns to the twisting point under positive tension and while delivering the filamentous yarn to the twisting point under substantially zero tension, the difference in tensions being such that in the completed strand the filamentous synthetic yarn tends to lie on the surface thus forming, in the one twisting operation, an open coiled helix of synthetic yarn winding around a bundle of cotton yarns, and employing such composite strands as warp and weft threads in the weaving of the dryer-felt so that the filamentous synthetic material constitutes from 6% to 14% by weight of the felt.

The Specification of the said Parent Application further describes and claims an asbestos dryer-felt in which the back ply or plies at least of the felt embody such composite strands protected by helical windings of filamentous synthetic material in the like proportions and a method of making such an asbestos dryer-felt.

In recent years there have been introduced papermakers' dryer-felts composed wholly or partly of yarns spun from synthetic fibres. The most commonly used synthetic fibres are polyethylene terephthalate, known as "Terylene" (a registered Trade Mark of Imperial Chemical Industries Ltd.), nylon and, less frequently, certain of the acrylic fibres. The fibres, either all of one type or in admixture

one type with another, are carded and spun into yarns and the yarns are used in the manufacture of dryer felts in a manner well known in the art.

5 We have found that, just as the helical winding of synthetic filament yarns round a core of yarns of cotton or asbestos in accordance with the Parent Application No. 796,562 produces a dryer-felt giving a greatly increased life, so also the helical winding of synthetic filament yarns round a core of yarns spun from synthetic fibres increases the service life of all synthetic dryer-felts and of dryer-felts composed partly of spun synthetic yarns.

10 The increased life obtained is due to the fact that, the flexural endurance, strength and abrasion-resistance of yarns spun from synthetic fibres generally are considerably greater than those of the natural fibres commonly used in dryer-felts, and the flexural endurance, strength and abrasion resistance of high-tenacity (ie: a tenacity greater than 5 gm./denier) synthetic filaments are greater still. Consequently when, by the combined action of flexing, abrasion, heat, moisture and acid, the core yarns of synthetic fibres begin to disintegrate, the helical windings of synthetic filaments, being less degraded, help to maintain the integrity of the individual yarns of the dryer-felt and thus of the dryer-felt itself.

15 In the present invention, the composite strands having a core of plied yarns of natural fibres (such as cotton) wound around with open helical windings of filamentous synthetic material and which are used in the production of papermaker's felts according to the invention of the Parent Patent are modified so as to have a core of yarns spun from synthetic fibres instead of a core of yarns of natural fibres and so that the percentage range specified therein is extended.

20 According to this invention, therefore, a papermakers' dryer-felt as claimed in any of the Claims 1 to 4 and 6 to 10 of Patent Specification No 796562 is modified in that the cores of the composite strands are of plied yarns spun from synthetic fibres, and the filamentous synthetic material of the helical windings constitute from 3% to 30% by weight of the felt.

25 The invention also comprises the method of making papermakers' dryer-felt according to claim 11 of Patent No 796562 modified in that spun synthetic yarns are substituted for cotton yarns and in that the filamentous synthetic material constitutes from 3%—30% by weight of the felt.

#### IN THE ACCOMPANYING DRAWINGS:—

30 FIG. 1 is a fragmentary plan view illustrating diagrammatically a piece of papermakers' dryer-felt made in accordance with a preferred example of the present invention;

35 FIG. 2 is a fragmentary view to a larger scale, diagrammatically illustrative of the

construction of one of the warp or weft strands employed in weaving the fabric of Fig. 1;

FIG. 3 is a diagrammatic transverse section on the line 3—3 of Fig. 2;

FIG. 4 is a large-scale diagrammatic view showing a piece of one of the composite warp or weft strands untwisted until the core yarns are parallel, and showing the synthetic filament yarn as it then appears.

FIGS. 5 and 6 are diagrams showing examples of weave structure according to the present invention.

Referring to the drawings, Fig. 1 represents a piece of dryer-felt embodying a preferred example of the present invention and comprising the warp threads W and weft threads F, it being understood that the warp threads and weft threads are interwoven to provide a multiply fabric in accordance with any customary weaving procedure in the manufacture of dryer-felts. As usual in the manufacture of dryer-felts, the warp threads and weft threads are of plied construction, each warp or weft thread comprising a plurality of spun synthetic yarns but in the construction shown, one yarn of each plied construction is of filamentous synthetic material. The term "filamentous synthetic material" as herein employed is intended to designate a strand consisting of filaments of a man-made substance, other than glass or regenerated cellulose, and produced for example, by extrusion, and is to be distinguished from the yarn which constitutes the remainder of the composite warp or weft thread and which is made by chopping up or otherwise dividing extruded filaments and thereafter forming the short sections into so-called "spun yarns" by spinning.

Among the multifilament synthetic materials which have been found to provide the desired characteristics in the dryer-felt in accordance with the present invention are nylon, which is a linear polyamide containing a multiplicity of structural units linked in series by amide or thioamide groupings; and polyethylene terephthalate, which is made and sold commercially by Imperial Chemical Industries Limited under the Registered Trade Mark "Terylene". These synthetic materials are capable of being formed into filaments, which when cold drawn, acquire a high tenacity.

In accordance with the present invention, the number and size of the spun synthetic yarns and synthetic filaments which are plied or otherwise wound together to make the protected warp and/or weft strand and the disposition of such protected yarn may be varied as desired, according to the type of synthetic fibre or fibres employed, or with respect to the particular requirements of the mill in which the felt is to be used, provided that the filamentous synthetic material constitutes

from 3% to 30% and preferably around 10% of the total weight of the plied yarn.

In the drawings (Figs. 2, 3 and 4) no attempt has been made to show the actual shapes of the plied yarns forming a warp or weft strand—the views being diagrammatic, and showing the yarns as ideally shaped and relatively arranged.

In preparing the warp threads W and weft threads F (Fig. 1) according to the present invention, spun synthetic yarns S (Figs. 2, 3 and 4) of the selected size and in the desired number are plied by twisting them together with one or more filamentous synthetic yarns N to form the desired plied strand. However, in so twisting the yarns together, the filamentous synthetic yarn is delivered to the twisting point at substantially zero tension, while concurrently the spun synthetic yarns are delivered at a positive tension, the difference between these tensions being such that in the completed strand the filamentous synthetic yarn tends to lie on the surface, forming in the one twisting operation, a thread having an outstanding protective helix or winding of filamentous synthetic material incorporated in the plied thread, the remainder of the yarn forming a core within such winding. As the helix of filamentous synthetic yarn tends to lie on the surface of the core constituted by the spun synthetic yarns, and because the synthetic filament yarn has a much higher tenacity than the spun synthetic yarn, offers greater resistance to abrasion, and has greater flexural endurance, it forms a sort of armour for the spun synthetic yarn, providing added strength to resist tension and flexing, and protecting it from the effects of abrasion, and thus, although it forms but a small percentage of the entire felt, nevertheless it adds very substantially to the useful life of the felt.

Merely by way of example, the plied yarn for warp or weft threads may be made as follows: Crimped fibres of polyethylene terephthalate are spun on the woollen system into yarn of 1085 denier. Three such yarns are plied together with two high tenacity multifilament nylon yarns, each of 210 denier, in the manner above described so that the multifilament nylon yarns form an outstanding protective open helix around the core of spun synthetic yarn. In this example the filamentous synthetic yarn constitutes 11.5% by weight of the felt.

Merely by the way of a further example, from a blend of 75% by weight of crimped polyethylene terephthalate fibres and 25% by weight of crimped nylon fibres a yarn of a count of 8,300 metres per kilogramme is spun on the woollen system. Three such yarns are plied together with one high-tenacity multifilament polyethylene terephthalate yarn of 250 denier and one high-tenacity multifilament nylon yarn of 210 denier in the

manner above described so that the multifilament synthetic yarns form an outstanding protective open helix around the core of spun synthetic yarn. In this example the filamentous synthetic yarn constitutes 12.4% by weight of the felt.

The following are examples of asbestos-containing felts:—

#### EXAMPLE A.

A warp-faced fabric suitable for use as a papermachine felt, is of the structure shown in Fig. 5. All of the warp yarns 1 to 8 are composed as follows: From a blend of 75% by weight of crimped polyester fibres and 25% by weight of crimped nylon fibres. These yarns are spun to a count of 170 grains per 100 yards; such yarns are plied three-fold and helically wrapped with one polyester filament yarn of 250 denier and one nylon filament yarn of 210 denier. All of the weft yarns *a* are composed of asbestos of a count equivalent to 1s cotton, helically wrapped with one nylon filament yarn of 210 denier. In this example the filamentous synthetic yarn constitutes 7% by weight approximately of the felt.

#### EXAMPLE B.

A weft-faced fabric suitable for use as a papermachine felt is of the structure shown in Fig. 6. The warp yarns 1 to 12 and the weft yarns are as for example A above. The resultant felt has an asbestos face, with a synthetic warp reinforced with helical windings of synthetic filaments. In this example the filamentous synthetic yarn constitutes 10% by weight approximately of the felt.

In twisting the yarns to form the plied thread, any desired twist may be employed, either in the Z or S direction, it being understood that the above specific examples are merely by way of illustration and not in any sense designed to indicate limitations upon the invention.

As well as the examples described above, a papermakers' dryer felt made according to the invention may have only the warp yarns modified, and one preferred percentage proportion for the filamentous synthetic material is 10%.

Our Patent Specification No. 810,603 describes and claims a papermakers' dryer felt consisting of "Terylene" and nylon in the proportion between 25% to 75% by weight of either with or without cotton and/or asbestos substituted for some of the "Terylene" and/or the nylon in a proportion leaving a minimum of 2% of both and such felt may be characterised in that the "Terylene" or nylon or both is or are present as a continuous filament yarn.

#### WHAT WE CLAIM IS:—

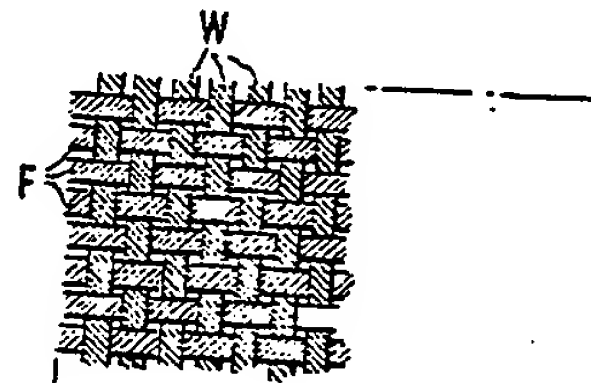
1. A papermakers' dryer felt as claimed in any of the Claims 1 to 4 and 6 to 10 of Patent Specification No 796562 modified in



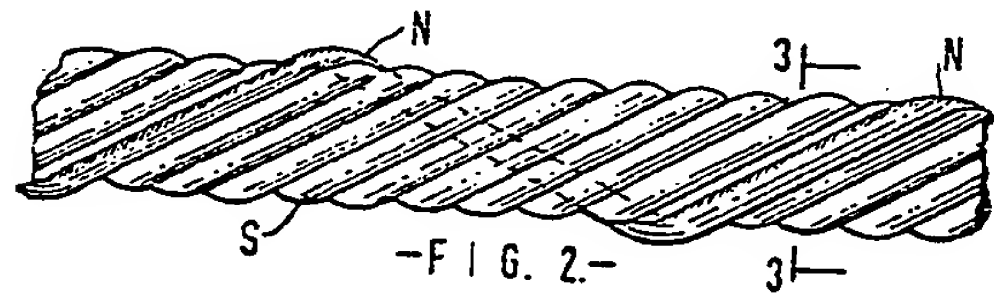
- that the cores of the composite strands are of  
plied yarns spun from synthetic fibres and  
the filamentous synthetic material of the  
helical windings constitute from 3% to 30%  
5 by weight of the felt.
2. A papermakers' dryer felt according to  
Claim 1 wherein the protected yarn is formed  
by doubling several strands of spun synthetic  
yarn with one or more filamentous yarns of  
10 synthetic material.
3. A papermakers' dryer felt according to  
claim 2 further characterised in that the  
filamentous synthetic material is of a high-  
tenacity type.
- 15 4. A papermakers' dryer felt according to  
either Claim 2 or 3 further characterised in  
that the filamentous synthetic material is  
filamentous nylon.
5. A papermakers' dryer felt according to  
20 either Claim 2 or 3 further characterised in  
that the filamentous synthetic material is fila-  
mentous polyethylene terephthalate.
6. The method of making papermakers'  
dryer felt according to Claim 11 of Patent  
25 No 796562 modified in that spun synthetic  
yarns are substituted for cotton yarns and in  
that the filamentous synthetic material con-  
stitutes from 3% to 30% by weight of the  
felt.
- 30 7. That method according to Claim 6  
wherein three yarns of polyethylene tere-  
phthalate fibres, each spun into yarn of 1085  
denier are twisted with two high-tenacity multi-  
filament nylon yarns, each of 210 denier.
- 35 8. That method according to Claim 6  
wherein three synthetic yarns, each spun to  
a count of 8,300 metres per kilogramme from  
a blend consisting of 75% by weight of poly-  
ethylene terephthalate fibres and 25% by  
weight of nylon fibres, are twisted with one  
40 high-tenacity multifilament polyethylene tere-  
phthalate yarn of 250 denier and one high-  
tenacity multifilament nylon yarn of 210  
denier.
9. That method of making a papermakers' 45  
multiply dryer felt wherein certain of the  
constituent strands which appear at the face  
of the fabric comprise asbestos fibres, includ-  
ing the step of employing, in the weaving of  
the back of the fabric, strands comprising 50  
spun synthetic yarns plied with filamentous  
synthetic yarns in such manner that the spun  
synthetic yarns form the core of the strand  
and the filamentous synthetic yarn forms an  
open spiral helix winding around the core, 55  
and wherein the filamentous synthetic material  
constitutes approximately 10% by weight of  
the strand.
10. A papermakers' dryer felt constructed  
substantially as herein described with reference 60  
to and as illustrated in the accompanying  
drawings, whereby the useful life is increased.
11. The method of making a papermakers'  
dryer felt with greater useful life, substantially  
as herein defined and described with reference 65  
to the accompanying drawings.

For the Applicants:

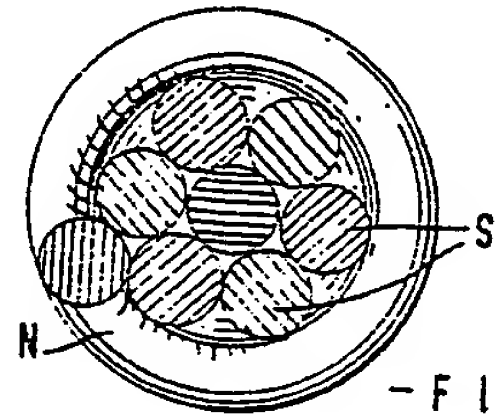
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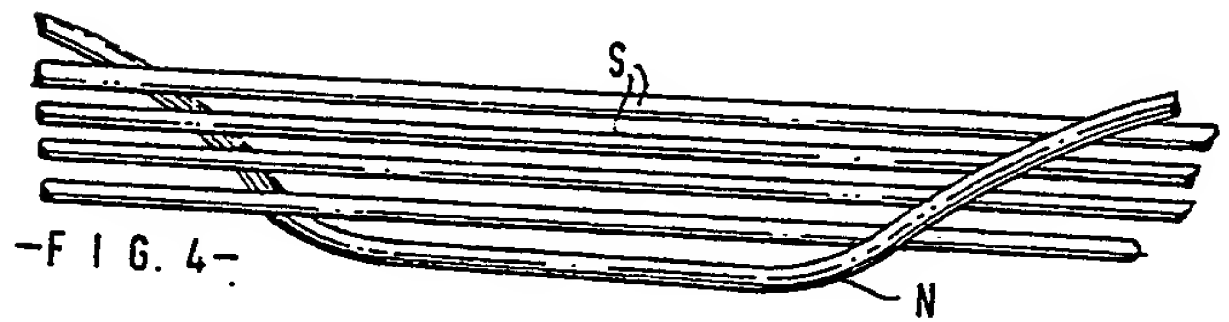
-FIG. 1-



-FIG. 2-



-FIG. 3-



-FIG. 4-

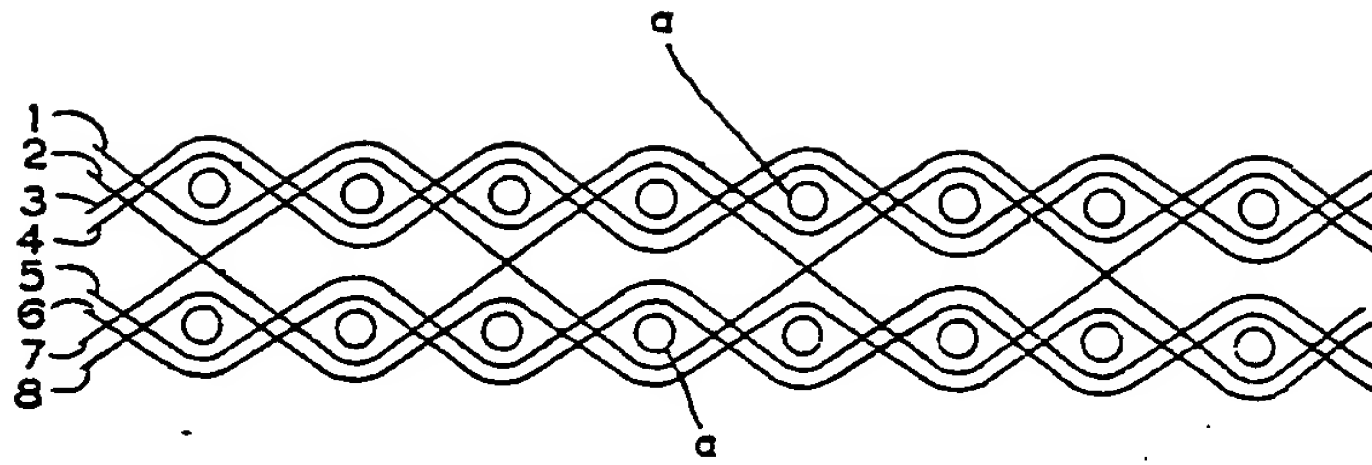
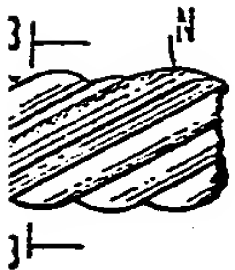


FIG. 5.

G. 3-

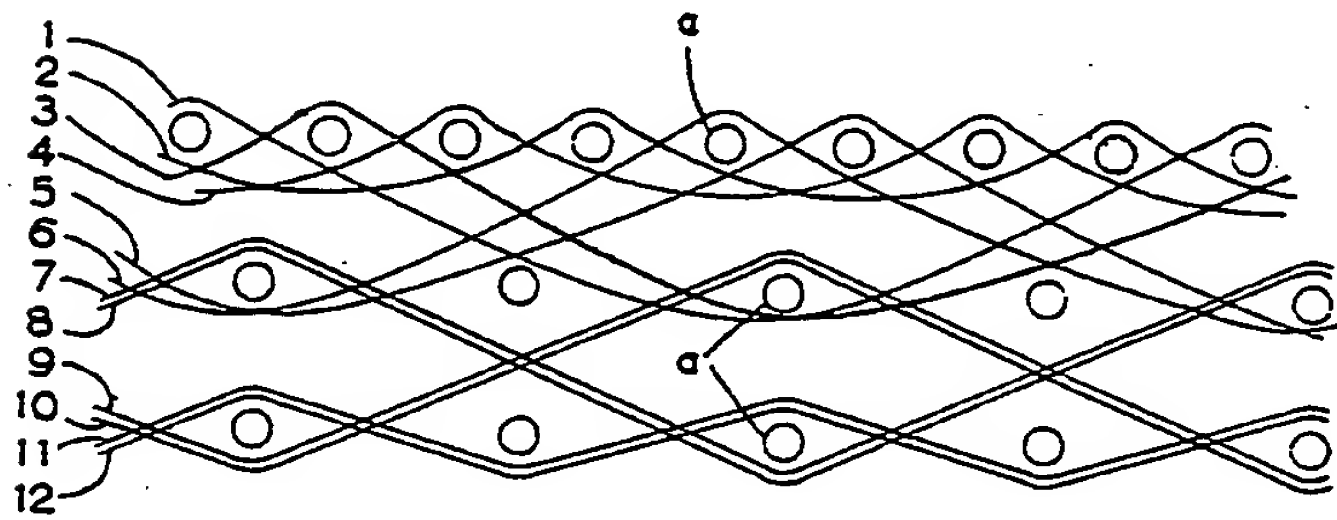
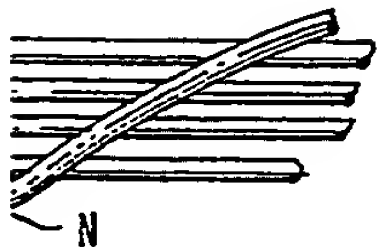


FIG. 6.